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## **Settlement will reduce carcinogens in potato chips**

By RAQUEL MARIA DILLON – Aug 1, 2008

LOS ANGELES (AP) — Snack lovers, rejoice: Munching on potato chips just got a little healthier.

Four food manufacturers agreed to reduce levels of a cancer-causing chemical in their potato chips and french fries under a settlement announced Friday by the state attorney general's office.

California sued H.J. Heinz Co., Frito-Lay, Kettle Foods Inc., and Lance Inc. in 2005, alleging they violated a state requirement that companies post warning labels on products with carcinogens.

The companies avoided trial by agreeing to pay a combined \$3 million in fines and reduce the levels of acrylamide in their products over three years, officials said.

"Other companies should follow this lead," Attorney General Jerry Brown said, calling the settlement "a victory for public health."

Acrylamide forms naturally when starchy foods are baked or fried. Studies have shown the chemical, which also has industrial uses, causes cancer in lab animals and nerve damage to workers who are exposed to high levels. The Food and Drug Administration is researching whether acrylamide in food poses a health risk.

"Everybody's trying to figure out how to lower levels (of acrylamide) without significantly, adversely affecting taste," said Michele Corish, an attorney for Lance, which produces Cape Cod chips.

Corish said the modified snacks will be available nationwide. Messages left with the other three companies were not immediately returned Friday night.

The attorney general's office said the levels of acrylamide in most Cape Cod chips are already near the compliance level as defined by the settlement. However, Brown said Cape Cod Robust Russets contain 25 times the acceptable amount.

Corish said "Robust Russets" chips are no longer being sold.

According to the terms of the settlement, Frito-Lay, which is owned by PepsiCo Inc. and produces most of the chips sold in California, will pay \$1.5 million and chip-maker Kettle Foods will pay \$350,000 in penalties. Heinz, which produces frozen fries and tater tots, agreed to pay \$600,000. Lance will pay \$95,000.

The state also sued McDonald's Corp.; Wendy's International Inc.; Burger King Corp.; KFC, a subsidiary of Yum Brands Inc.; and Procter & Gamble Co. over acrylamide levels in 2005. Those lawsuits were settled after the companies agreed to either properly label their products or lower levels of the chemical.

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**CFSAN/Office of Plant & Dairy Foods**

**December 2002; Updated March 2003, March 2004, June 2005 and July 2006**

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## **Survey Data on Acrylamide in Food: Individual Food Products**

[Data through November 15, 2002](#)

[Data through February 7, 2003](#)

[Data through October 1, 2003](#)

[Data through October 7, 2004](#)

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On April 24, 2002, researchers at the Swedish National Food Administration and Stockholm University reported finding the chemical acrylamide in a variety of fried and oven-baked foods. The initial Swedish research indicated that acrylamide formation is particularly associated with traditional high temperature cooking processes for certain carbohydrate-rich foods. In response to concerns about the potential risk of foodborne acrylamide based on the known toxicity of acrylamide at much higher doses than those seen in foods, the FDA began to analyze a variety of U.S. food products for acrylamide. The data presented below in Tables 1-4 are results from FDA's survey of individual food products. FDA also surveyed composite food samples from the Agency's Total Diet Study (TDS) for acrylamide; the TDS data are available at [Survey Data on Acrylamide in Food: Total Diet Study Results](#).

FDA has completed several exposure assessments for acrylamide, using the individual food product and TDS data on acrylamide levels in food. The most recent update of the exposure assessment can be viewed at [The 2006 Exposure Assessment for Acrylamide](#).

FDA studies of acrylamide levels in food are part of a comprehensive research program involving exposure assessment, methodology development, research on formation and mitigation of acrylamide in food, and research on acrylamide toxicology. More information on the research program for acrylamide can be found in FDA's [Action Plan for Acrylamide in Food](#).

Note that the results in Tables 1-4 below indicate acrylamide levels in individual purchased food products, and generally do not address unit to unit variation or lot to lot variation. These data should not be taken as an indicator of food product choices by consumers.

**Notes for Tables 1-3:**

1. (1) ND = nondetect
2. (2) The general limit of quantitation (LOQ) of the method for Tables 1-3 is 10 ppb. Values below the LOQ but above 0 are reported as <10 ppb, except for brewed coffee. The LOQ for brewed coffee is approximately 1 ppb. Therefore, values reported for brewed coffee can be considered accurate above 1 ppb.
3. (3) Dried and/or powdered products (ground coffee and certain cereals) were tested as purchased, unless otherwise noted.

**Table 1: Acrylamide values in food product samples**  
(data collected through November 15, 2002)

Product		Acrylamide (ppb)
Baby food	Beech Nut Stage 2 Apples & Cherries	ND
	Gerber 2nd Foods Apples & Cherries	ND
	Beech Nut Stage 2 Butternut Squash	22
	Gerber 2nd Foods Squash	ND
	Beech Nut Stage 2 Carrots & Peas	17
	Gerber 2nd Foods Carrots & Sweet Peas	39
	Beech Nut Stage 1 Oatmeal Cereal for Baby	ND
	Carnation Baby Cereal with Formula Oatmeal	ND
	Gerber Single Grain Oatmeal Cereal for Baby	ND
	Beech Nut Rice Cereal for Baby	<10
	Carnation Baby Cereal with Formula Rice	<10
	Beech Nut Stage 2 Tender Golden Sweet Potatoes	37
	Gerber Tender Harvest Organic Sweet Potatoes (lot 1)	62
	Gerber Tender Harvest Organic Sweet Potatoes (lot 2)	121
	Gerber 2nd Foods Sweet Potatoes	68
	Beech Nut Stage 2 Vegetables & Chicken	75
	Gerber 2nd Foods Vegetable Chicken Dinner	30
	Gerber 2nd Foods Green Beans	26
	Gerber Finger Foods Biter Biscuits	130
	Gerber Finger Foods Fruit Wagon Wheels	20
	Gerber Graduates for Toddlers Animal Crackers	60
	Gerber Mixed Cereal for Baby	ND
	Nabisco Arrowroot Biscuit (baby food)	113
	Nabisco Zwieback Toast (baby food)	20

French fries	Arby's french fries	252
	Burger King french fries, location 1	197
	Burger King french fries, location 2	220
	Burger King french fries, location 3	369
	Checkers french fries, location 1	257
	Checkers french fries, location 2	407
	Chick-fil-A french fries	389
	Fuddruckers french fries, location 1	452
	Fuddruckers french fries, location 2	346
	KFC french fries, location 1	313
	KFC french fries, location 2	270
	KFC french fries, location 3	162
	KFC french fries, location 4	117
	McDonald's french fries, location 1	193
	McDonald's french fries, location 2	328
	McDonald's french fries, location 3	155
	McDonald's french fries, location 4	326
	McDonald's french fries, location 5	245
	McDonald's french fries, location 6	270
	McDonald's french fries, location 7	497
	Popeyes french fries, location 1	301
	Popeyes french fries, location 2	484
	Popeyes french fries, location 3	1030
	Popeyes french fries, location 4	610
	Wendy's french fries, location 1	302
	Wendy's french fries, location 2	157
	Wendy's french fries, location 3	254
	Wendy's french fries, location 4	260
	Wendy's french fries, location 5	169
	McCain Crinkle Cut french fries (not baked)	49
	McCain Crinkle Cut french fries (baked)	356
	Ore Ida Golden Crinkles (not baked)	74
	Ore Ida Golden Crinkles (baked)	441
	Lamb Weston Inland Valley French Fries (not baked)	212
	Lamb Weston Inland Valley French Fries (baked)	798

	Ore Ida Golden Fries (not baked)	107
	Ore Ida Golden Fries (baked)	1098
	Richfood French Fried Potatoes (not baked)	21
	Richfood French Fried Potatoes (baked)	438
	Lamb Weston Inland Valley Fajita Fries (not baked)	200
	Lamb Weston Inland Valley Fajita Fries (baked)	1325
	Ore Ida Zesties! (not baked)	67
	Ore Ida Zesties! (baked)	572
	Linden Farms French Fries Shoestring Style (not baked)	70
	Linden Farms French Fries Shoestring Style (baked)	1036
	Ore Ida Fast Food Fries (not baked)	79
	Ore Ida Fast Food Fries (baked)	332
	Ore Ida Crispers! (not baked)	218
	Ore Ida Crispers! (baked)	616
	Ore Ida Golden Twirls (not baked)	20
	Ore Ida Golden Twirls (baked)	119
	Ore Ida Tater Tots (not baked)	199
	Ore Ida Tater Tots (baked)	255
Potato chips	Good Health Natural Foods Olive Oil Potato Chips Plain	385
	Herr's Crisp 'N Tasty Potato Chips	468
	Lay's Classic Potato Chips, code date Oct. 15	249
	Lay's Classic Potato Chips, code date Oct. 29	318
	Lay's Classic Potato Chips, code date Nov. 5, bag 1	319
	Lay's Classic Potato Chips, code date Nov. 5, bag 2	398
	Lay's Classic Potato Chips, code date Nov. 5, bag 3	338
	Lay's Classic Potato Chips, code date Nov. 5, bag 4	337
	Lay's Classic Potato Chips, code date Nov. 12, bag 1	432
	Lay's Classic Potato Chips, code date Nov. 12, bag 2	462
	Lay's Classic Potato Chips, code date Nov. 12, bag 3	462
	Lay's Classic Potato Chips, code date Nov. 19, bag 1	280
	Lay's Classic Potato Chips, code date Nov. 19, bag 2	301
	Lay's Classic Potato Chips, code date Nov. 19, bag 3	283
	Lay's Classic Potato Chips, code date Nov. 19, bag 4	258
	Lay's Classic Potato Chips, code date Nov. 26, bag 1	257
	Lay's Classic Potato Chips, code date Nov. 26, bag 2	262

	Lay's Classic Potato Chips, code date Nov. 26, bag 3	275
	Lay's Classic Potato Chips, code date Nov. 26, bag 4	303
	Lay's Classic Potato Chips, code date Dec. 3, bag 1	343
	Lay's Classic Potato Chips, code date Dec. 3, bag 2	333
	Lay's Classic Potato Chips, code date Dec. 3, bag 3	291
	Lay's Classic Potato Chips, code date Dec. 3, bag 4	336
	Lay's Classic Potato Chips, code date Dec. 10, bag 1	425
	Lay's Classic Potato Chips, code date Dec. 10, bag 2	463
	Lay's Classic Potato Chips, code date Dec. 10, bag 3	490
	Lay's Classic Potato Chips, code date Dec. 10, bag 4	549
	Utz Crisp All Natural Potato Chips, lot 1	879
	Utz Crisp All Natural Potato Chips, lot 2	433
	Grandma Utz's Handcooked Potato Chips	146
	Kettle Chips Lightly Salted Natural Gourmet Potato Chips	1265
	Lay's Kettle Cooked Mesquite BBQ Flavored Potato Chips	198
	Utz's Home Style Kettle-Cooked Potato Chips	117
	Lay's WOW! Original potato chips	415
	Ruffles WOW! Original potato chips	270
	Ruffles Original potato chips	292
	Wavy Lay's Original Potato Chips	198
	Baked! Lay's Original Naturally Baked Potato Crisps	1096
	Terra Sweet Potato Chips	767
	Route 11 Sweet Potato Chips	2762
Infant formulas	Carnation Good Start Milk-Based Infant Formula (liquid)	ND
	Carnation Good Start Milk-Based Infant Formula (powdered)	ND
	Enfamil Milk-Based Infant Formula with Iron (liquid)	ND
	Enfamil Milk-Based Infant Formula with Iron (powdered)	<10
	Similac Infant Formula with Iron (liquid)	ND
	Similac Infant Formula with Iron (powdered)	<10
	Carnation Alsoy Soy Infant Formula (liquid)	ND
	Carnation Alsoy Soy Infant Formula (powdered)	ND
	Enfamil ProSobee Soy Formula (liquid)	ND
	Enfamil ProSobee Soy Formula (powdered)	ND
	Isomil Infant & Toddler Soy Formula with Iron (powdered)	ND
	Isomil Soy Formula with Iron (liquid)	ND

<b>Protein foods</b>	Checkers Chicken Pieces	22
	Tyson Crispy Chicken Strips (not baked)	32
	Tyson Crispy Chicken Strips (baked)	35
	Gorton's Tenders Extra Crunchy fish fillets (not baked)	25
	Gorton's Tenders Extra Crunchy fish fillets (baked)	30
	Mrs. Paul's Crispy Fish Fillets (not baked)	13
	Mrs. Paul's Crispy Fish Fillets (baked)	12
	Van de Kamp's Crunchy Fish Sticks (not baked)	ND
	Van de Kamp's Crunchy Fish Sticks (baked)	ND
	Pastene Fancy Light Tuna in Olive Oil	ND
	Progresso Light Tuna in Olive Oil	ND
	Boca Burgers Grilled Vegetable burgers (not baked)	58
	Boca Burgers Grilled Vegetable burgers (baked)	116
	Boca Nuggets Original Chik'n (not baked)	<10
	Boca Nuggets Original Chik'n (baked)	<10
	Morningstar Farms Breakfast Patties (not baked)	ND
	Morningstar Farms Better 'n Burgers (not baked)	ND
	Morningstar Farms Better 'n Burgers (baked)	ND
	Worthington Veja-Links (uncooked)	ND
	Worthington Veja-Links (microwaved)	ND
	Worthington Veja-Links (toasted)	ND
<b>Breads and bakery products</b>	Pepperidge Farm Dark Pump Pumpernickel (not toasted)	34
	Pepperidge Farm Dark Pump Pumpernickel (toasted)	364
	Pepperidge Farm Natural Whole Grain Whole Wheat (not toasted)	ND
	Pepperidge Farm Natural Whole Grain Whole Wheat (toasted)	59
	Pepperidge Farm Original White Bread (not toasted)	36
	Pepperidge Farm Original White Bread (toasted)	216
	Sara Lee Honey Wheat Bagels (not toasted)	27
	Sara Lee Honey Wheat Bagels (toasted)	57
	Sara Lee Plain Mini Bagels (not toasted)	58
	Sara Lee Plain Mini Bagels (toasted)	343
	Contadina Bread Crumbs Three Cheese	39
	Super G Bread Crumbs Regular Style	42
	Shoppers Food Warehouse Cake Doughnut	24



	Shoppers Food Warehouse French Twirl Doughnut	ND
	Shoppers Food Warehouse Plain Doughnut	14
	Indian flat bread (from local restaurant)	125
	Boboli Italian Pizza Crust (not baked)	33
	Boboli Italian Pizza Crust (baked)	24
	La Banderita Corn Tortillas (not fried)	10
	La Banderita Corn Tortillas (fried)	13
	La Banderita Flour Tortillas (not fried)	<10
	La Banderita Flour Tortillas (fried)	15
<b>Cereals</b>	General Mills Cheerios	266
	General Mills Cinnamon Toast Crunch	61
	General Mills Honey Nut Cheerios	146
	General Mills Lucky Charms	176
	Kellogg's Corn Flakes	77
	Kellogg's Corn Pops	71
	Kellogg's Frosted Flakes	52
	Kellogg's Frosted Mini-Wheats	78
	Kellogg's Raisin Bran	156
<b>Snack foods (other than potato chips)</b>	Kellogg's Rice Krispies	47
	Chifles Fried Pork Rinds Smokehouse Flavored	12
	Gen Soy Zesty Barbeque Soy Crisps	17
	Super G Cheddar Cheese Corn Twists	133
	Super G Microwave Popping Corn (popped)	181
	Orville Redenbacher's Gourmet Popping Corn Movie Theater Butter (popped)	157
	Good Health Natural Foods Honey Dijon Mustard Julienne Potato Stix	1168
	Herr's Bite Size Dippers Tortilla Chips	117
	Herr's Extra Thin Pretzels	309
	Utz Unsalted Sourdough Specials	70
	Snyder's of Hanover Veggie Crisps	832
	Terra Stix	990
	Utz White Corn Tortillas	111
<b>Gravies and seasonings</b>	Heinz Home Style Savory Beef Gravy (canned)	ND
	Heinz Home Style Classic Chicken Gravy (canned)	ND

	Butterball Brown Gravy Mix	ND
	McCormick Mushroom Gravy Mix	ND
	McCormick Turkey Gravy Mix	ND
	Kame Dark Soy Sauce	ND
	Kikkoman Soy Sauce	ND
	Colgin Natural Hickory Liquid Smoke	54
	Colgin Natural Pecan Liquid Smoke	151
	Stubb's Mesquite Liquid Smoke	38
	Accent Flavor Enhancer	ND
	Char Crust Roto Roast Dry-Rub Seasoning	ND
	Wyler's Shakers Beef & French Onion Flavor Instant Bouillon	ND
<b>Nuts and nut butters</b>	Blue Diamond Roasted Salted Almonds	236
	Blue Diamond Smokehouse Almonds	457
	Planters Salted Almonds	249
	Planters Smoked Almonds	339
	Planters Halves and Pieces Lightly Salted Cashews	ND
	Super G Dry Roasted Peanuts Unsalted	28
	Super G Honey Roasted Peanuts	ND
	Super G Party Peanuts	ND
	Arrowhead Mills Crunchy Peanut Butter	114
	Jif Creamy Peanut Butter	64
	Peter Pan Plus Creamy Peanut Butter	89
	Richfood Creamy Peanut Butter	79
	Smucker's Natural Creamy Peanut Butter	125
<b>Crackers</b>	Red Oval Farms Mini Stoned Wheat Thins	26
	Dare Breton Thin Wheat Crackers	300
	Super G Unsalted Tops Crackers	41
	Keebler Town House Crackers Reduced Fat	130
	Pepperidge Farm Cheddar Goldfish	57
	Streit's Lightly Salted Matzos	182
	Wasa Original Crispbread Fiber Rye	504
<b>Chocolate products</b>	Droste Cocoa	ND
	Ghirardelli Unsweetened Cocoa	316
	Hershey's Cocoa	909
	Hershey's European Style Dutch Processed Cocoa	58

	Baker's Bittersweet Baking Chocolate Squares	104
	Ghirardelli Bittersweet Chocolate Baking Bar	93
	Hershey's Milk Chocolate Bar	ND
	Hershey's Chocolate Milk Mix	ND
	Nestle Nesquik Chocolate Flavor	45
	Land O Lakes Cocoa Classics Chocolate Supreme Artificially Flavored	<10
	Super G Hot Cocoa Mix Milk Chocolate Flavor	24
	Swiss Miss Milk Chocolate Flavor Hot Cocoa Mix	ND
	Jell-O Chocolate Flavor Instant Pudding & Pie Filling	15
	Super G Chocolate Flavor Instant Pudding & Pie Filling	17
<b>Canned fruits and vegetables</b>	Mott's Apple Sauce	<10
	Richfood Apple Sauce Cinnamon	<10
	B&M Original Brick Oven Baked Beans	83
	B&M Vegetarian 99% Fat Free Brick Oven Baked Beans	70
	Green Giant Sliced Mushrooms Broiled in Butter	ND
	Super G Mushrooms Stems and Pieces	ND
	Cedar Chick Peas	ND
	Libby's Pumpkin	25
<b>Cookies</b>	Archway Oatmeal Cookies	36
	Nabisco Chips Ahoy! Chewy Chocolate Chip Cookies	97
	Nabisco Chocolate Teddy Grahams	199
	Stella D'Oro Anisette Toast Cookies	107
<b>Coffee</b>	Maxwell House Slow Roast (ground, not brewed)	209
	Starbucks Coffee Columbia Ground (ground, not brewed)	175
	Super G Instant Coffee (powdered, not brewed)	188
	Folgers Classic Decaf Coffee Crystals (crystals, not brewed)	351
	Maxwell House Instant Coffee (powder, not brewed)	263
	Medaglia D'Oro Caffè Espresso Coffee (ground, not brewed)	179
<b>Frozen vegetables</b>	Hanover Premium Petite Asparagus Spears	<10
	Hanover Blue Lake French Style Green Beans	<10
	Hanover Premium Petite Whole Carrots	<10
	Super G Cooked Squash	<10
<b>Dried foods</b>	Knorr Taste Breaks Soup Chicken Noodle Flavor	22
	Maruchan Instant Lunch Ramen Noodles with Vegetables	52

	Chicken Flavor	
	Nissin Cup Noodles Chicken Flavor	136
	Lipton Noodles & Sauce Creamy Chicken	17
	Lipton Asian Side Dishes Teriyaki Noodles	34
	Kraft Macaroni & Cheese Dinner	11
	Super G Macaroni & Cheese Dinner	12
	Lipton Recipe Secrets Onion Soup & Dip Mix	1184
	Super G Onion Recipe Soup Mix	90
	Lipton Rice & Sauce Herb & Butter	<10
Dairy	Grace Sweetened Condensed Milk	ND
	Carnation Malted Milk Original	43
	Carnation Instant Nonfat Dry Milk	11
	Saco Cultured Buttermilk Blend	<10
Miscellaneous	Fuddruckers Onion Rings	13
	General Mills Lucky Charms marshmallows	ND
	Idahoan Butter & Herb Mashed Potatoes	ND
	Jell-O Gelatin Dessert Raspberry Artificial Flavor	<10
	Super G Raspberry Artificial Flavor Gelatin Dessert	<10
	KFC Mashed Potatoes	<10
	Kraft Quick Cooking Minute Tapioca	<10
	Mrs. Richardson's Butterscotch Caramel Topping	ND
	Idaho Spuds Mashed Potatoes	ND
	Super G Non-Dairy Coffee Creamer	<10

**Table 2: Acrylamide values in food product samples**  
(data collected between November 16, 2002 and February 7, 2003)

Product			Acrylamide (ppb)
Breads and bakery products	Breads	Arnold Real Jewish Rye Bread Caraway Seed	42
		Arnold Bakery Light 100% Whole Wheat Bread	102
		Home Pride Butter Top Wheat Bread	52
		Maier's Butter Top Wheat bread	96
		Maier's Butter Top White bread	<10
		Schmidt Old Tyme Split-Top Wheat Bread	130

		Stroehmann Dutch Country Potato Bread	36
		Sunbeam Enriched Bread, white	18
		Wonder Bread, white	<10
	<b>Bagels</b>	Schmidt Old Tyme Bagels Plain	12
		Thomas' New York Style Bagels Plain	27
	<b>Pies and Pastry</b>	Cherry Lattice Pie (purchased from local grocer)	11
		Mom's Southern Pecan Pie	14
		Snackees Apple Strudel	19
		Whole Foods Market Blueberry Pie	<10
		Whole Foods Market Mini Apple Pie Dairy Free	34
		Whole Foods Market Mini Cherry Pie Dairy Free	29
		Whole Foods Market Pear Frangipan mini	74
		Whole Foods Market Pecan Pie	25
		Whole Foods Market Pumpkin Pie	29
<b>Cereals</b>	<b>Muesli/Granola</b>	Breadshop's Sierra Crunch Muesli	51
		Familia Original Recipe Swiss Muesli	11
		Health Valley Low-Fat Granola Tropical Fruit	89
		Heartland Granola Cereal Original	28
		Kellogg's Mueslix Cereal with Raisins, Dates & Almonds	30
		Quaker 100% Natural Granola Oats, Honey & Raisins	84
		Sunbelt Fruit & Nut Granola Cereal, Raisins, Dates & Almonds	20
	<b>Other Cereals</b>	Post Grape-nuts	67
		Post Selects Great Grains, Raisins, Dates, Pecans	44
		Wheatena Toasted Wheat Cereal	1057
		Whole Foods Market 365 Oat Bran Flakes Cereal	189
<b>Coffee</b>	<b>Regular Roasts</b>	Chock full o' Nuts All-Method Grind, Lot 1 (ground, not brewed)	205
		Chock full o' Nuts All-Method Grind, Lot 2 (ground, not brewed)	186
		Chock full o' Nuts 100% Colombian Coffee (ground, not brewed)	245
		Folgers Classic Roast (medium roast), Lot 1 (ground, not brewed)	374
		Folgers Classic Roast (medium roast), Lot 2 (ground,	353

	not brewed)	
	Folgers Classic Roast (medium roast), Lot 3 (ground, not brewed)	350
	Folgers Classic Decaf (medium roast), Lot 1 (ground, not brewed)	312
	Folgers Classic Decaf (medium roast), Lot 2 (ground, not brewed)	361
	Folgers Classic Decaf (medium roast), Lot 3 (ground, not brewed)	326
	Hills Bros Coffee, Lot 1 (ground, not brewed)	191
	Hills Bros Coffee, Lot 2 (ground, not brewed)	149
	Hills Bros 100% Colombian Coffee (ground, not brewed)	64
	Maxwell House Master Blend (ground, not brewed)	215
	Maxwell House Original Signature Blend, Lot 1 (ground, not brewed)	250
	Maxwell House Original Signature Blend, Lot 2 (ground, not brewed)	170
	Maxwell House Original Signature Blend Decaf, Lot 1 (ground, not brewed)	222
	Maxwell House Original Signature Blend Decaf, Lot 2 (ground, not brewed)	258
	Melitta Traditional Premium Roast coffee (ground, not brewed)	332
	Sanka Decaffeinated Coffee, Lot 1 (ground, not brewed)	351
	Sanka Decaffeinated Coffee, Lot 2 (ground, not brewed)	244
	Starbucks Coffee Breakfast Blend (ground, not brewed)	161
	Starbucks Coffee Colombia (ground, not brewed)	163
	Starbucks Coffee House Blend (ground, not brewed)	151
	Yuban 100% Colombian Coffee, Lot 1 (ground, not brewed)	45
	Yuban 100% Colombian Coffee, Lot 2 (ground, not brewed)	37
	Yuban 100% Colombian Coffee, Lot 3 (ground, not brewed)	70
<b>Dark Roasts</b>	Café Bustelo Dark Roast, Lot 1 (ground, not brewed)	142

	Café Bustelo Dark Roast, Lot 2 (ground, not brewed)	138
	Café Bustelo Dark Roast, Lot 3 (ground, not brewed)	134
	Chock full o' Nuts Rich French Roast, Lot 1 (ground, not brewed)	257
	Chock full o' Nuts Rich French Roast, Lot 2 (ground, not brewed)	154
	Chock full o' Nuts Rich French Roast, Lot 3 (ground, not brewed)	163
	Folgers French Roast (medium-dark roast), Lot 1 (ground, not brewed)	319
	Folgers French Roast (medium-dark roast), Lot 2 (ground, not brewed)	231
	Folgers French Roast (medium-dark roast), Lot 3 (ground, not brewed)	162
	Maxwell House French Roast, Lot 1 (ground, not brewed)	235
	Maxwell House French Roast, Lot 2 (ground, not brewed)	185
	Maxwell House French Roast, Lot 3 (ground, not brewed)	184
	Medaglia D'oro Caffè Espresso, Lot 1 (ground, not brewed)	194
	Medaglia D'oro Caffè Espresso, Lot 2 (ground, not brewed)	155
	Medaglia D'oro Caffè Espresso, Lot 3 (ground, not brewed)	144
	Starbucks Coffee French Roast, Lot 1 (ground, not brewed)	150
	Starbucks Coffee French Roast, Lot 2 (ground, not brewed)	149
	Starbucks Coffee French Roast, Lot 3 (ground, not brewed)	97
<b>Brewed Coffees</b>	7-Eleven Regular Coffee (brewed)	5
	7-Eleven French Roast Coffee (brewed)	6
	Dunkin' Donuts Coffee Regular (brewed)	10
	McDonald's Regular Coffee (brewed)	8
	Starbucks Coffee Colombia (brewed)	7
	Starbucks Coffee Lite Note (brewed)	11
<b>Cookies</b>	Keebler Rumbly Grahams Cinnamon	334

		Keebler Sesame Street Animal Crackers	346	
		Stauffer's Animal Crackers	432	
Crackers		ak-mak Bakeries 100% Whole Wheat Stone Ground Sesame Cracker	343	
		Dare Vinta Crackers	112	
		Devonsheer Unsalted Plain Melba Toast	69	
		Fat Free Natural Ry-Krisp	620	
		Keebler Holiday Wheatables Original	37	
		Manischewitz Matzos unsalted	208	
		Stella D'Oro Breadsticks Original	100	
		Wasa Crisp 'N Light Crackerbread Sourdough Rye	184	
		Fruits and vegetables, canned	Asparagus	Green Giant Extra-Long Tender Green Asparagus Spears
Richfood Fancy Cuts & Tips Asparagus	ND			
Beans	Old El Paso Refried Beans Traditional		11	
Beets	Del Monte Fresh Cut Sliced Beets		<10	
	Richfood Sliced Beets		<10	
Green Beans	Del Monte Fresh Cut Specialties Blue Lake Whole Green Beans		<10	
	Libby's Blue Lake Cut Green Beans		<10	
Pineapple	Dole Pineapple Chunks in its Own Juice		10	
	Dole Pineapple Slices in Heavy Syrup		<10	
	3 Diamonds Sliced Pineapple in Unsweetened Pineapple Juice		<10	
Spinach	Del Monte Fresh Cut Whole Leaf Spinach		ND	
	Richfood Leaf Spinach		<10	
Potato chips			Pringles Original Potato Crisps	693
			Pringles Ridges Original Potato Crisps	1286
		Pringles Sweet Mesquite BBQ Flavored Potato Crisps	2510	
Snack foods (other than potato chips)		Baked! Doritos Nacho Cheesier!	193	
		Richfood Shoestring Potatoes	1243	
		Sun Chips Original Flavor	199	
		Utz Baked Tortillas	220	
Miscellaneous		Nature's Path Organic Optimum Power Breakfast, Flax, Soy, Blueberry	398	



	Odwalla Bar! Chocolate Chip Peanut	70
	Polaner All Fruit Spreadable Fruit, Pineapple	<10
	Smucker's Apple Jelly	ND
	Smucker's Seedless Strawberry Jam	ND

**Table 3: Acrylamide values in food product samples**  
(data collected between February 8, 2003 and October 1, 2003)

Product		Acrylamide (ppb)
Cereals	Wheatena Toasted Wheat Cereal, Lot 1	689
	Wheatena Toasted Wheat Cereal, Lot 2	467
Coffee	Café Bustelo Dark Roast (brewed)	6
	Dunkin' Donuts (brewed)	8
	Folgers Classic Roast (medium roast) (brewed)	13
	Folgers Classic Decaf (medium roast) (brewed)	11
	Maxwell House Master Blend (brewed)	8
	Medaglia D'oro Caffè Espresso (brewed)	6
	Starbucks (brewed)	8
	7-Eleven (brewed)	6
	Folgers Classic Roast Instant Coffee (powdered, not brewed)	458
	Folgers Classic Roast Instant Coffee (brewed)	6
	Maxwell House Instant Coffee, Naturally Decaffeinated (powdered, not brewed)	172
	Maxwell House Instant Coffee, Naturally Decaffeinated (brewed)	3
	Nescafé Classic Instant Coffee (powdered, not brewed)	471
	Nescafé Classic Instant Coffee (brewed)	6
	Safeway Instant Coffee (powdered, not brewed)	377

	Safeway Instant Coffee (brewed)	6
	Taster's Choice Chocolate Roast Instant Coffee (powdered, not brewed)	266
	Taster's Choice Gourmet Roast Instant Coffee (powdered, not brewed)	411
	Taster's Choice Gourmet Roast Instant Coffee (brewed)	6
	Taster's Choice Hazelnut Roast Instant Coffee (powdered, not brewed)	263
	Taster's Choice Naturally Decaffeinated Instant Coffee (powdered, not brewed)	539
	Taster's Choice Naturally Decaffeinated Instant Coffee (brewed)	7
	Taster's Choice Vanilla Roast Instant Coffee (powdered, not brewed)	286
<b>Dairy</b>	Giant Foods Low Fat Milk, 1% Milkfat	ND
	Lucerne Fat Free Milk	ND
	Lucerne Reduced Fat Milk, 2% Milkfat	ND
	Lucerne Whole Milk	ND
<b>Fruits and vegetables</b>	Del Monte Fresh Cut Sliced New Potatoes	ND
	Del Monte Fresh Cut Sliced New Potatoes (accompanying liquid)	ND
	Super G Sliced White Irish Potatoes	ND
	Super G Sliced White Irish Potatoes (accompanying liquid)	ND
	Super G Whole New Irish Potatoes	ND
	Super G Whole New Irish Potatoes (accompanying liquid)	ND
	Giant Foods Large Pitted Ripe Olives	375
	Giant Foods Sliced Ripe Olives	252
	Giant Foods Chopped Ripe Olives	479
	Safeway Small Pitted Ripe Olives	226

	Safeway Sliced Ripe Olives	500
	Safeway Chopped Ripe Olives	1363
	Super G Chopped Ripe Olives	1925
<b>Hot Beverages (other than coffee)</b>	Postum Original Caffeine Free Instant Hot Beverage (powdered, not brewed), lot 1, sample 1	3747
	Postum Original Caffeine Free Instant Hot Beverage (brewed), lot 1, sample 1	93
	Postum Original Caffeine Free Instant Hot Beverage (powdered, not brewed), lot 1, sample 2	5399
<b>Juice</b>	Giant Orchard Harvest Prune Juice	267
<b>Potato chips</b>	Terra Blues Potato Chips	1077
<b>Snack foods (other than potato chips)</b>	Herr's Extra Thin Pretzels, no salt added	151

**Notes for Table 4:**

1. (1) ND = nondetect
2. (2) Unless indicated otherwise, the foods in Table 4 were analyzed by a private laboratory under contract to an FDA-University of Maryland consortium, the Joint Institute for Food Safety and Applied Nutrition. The foods were collected and supplied to the laboratory by the FDA. For select samples, where indicated, analysis was done at the FDA.
3. (3) Unless indicated otherwise, the limit of quantitation (LOQ) of the method used in analyses in Table 4 is 20 ppb. Values below 20 ppb are reported as NDs. For select samples, either in the infant formula section or where indicated with a \*\*, the LOQ is 10 ppb. In these cases, values below 10 ppb are reported as NDs.
4. (4) Frozen products were not given additional cooking prior to testing.
5. (5) A significant number of foods in this survey were collected from restaurants and take-out stores to assess acrylamide levels in freshly cooked products. These foods were chosen from three cuisines common in the American diet.

**Table 4: Acrylamide values in food product samples**  
(data collected between November 20, 2003, and October 7, 2004)

<b>Product</b>		<b>Acrylamide (ppb)</b>
<b>Chocolate Candies and Miscellaneous Desserts</b>	Fritzie Fresh Chocolate Stars	ND
	Godiva Chocolate Caramel	37

	Good Sense Milk Chocolate Double Dipped Malted Milk Balls	43
	JELL-O Strawberry Banana Artificial Flavor Gelatin Dessert	ND
	M&M's Milk Chocolate Candies	21
	Marshall Field's Chocolates (Variety)	34
	Maud Borup Chocolates (Variety)	34
	Wood's Chocolates Chocolate Malt Balls	74
	Wood's Chocolates Milk Almond Bark	43
Coffee	Aspen Select Texas Pecan Whole Bean Coffee (ground, not brewed)	99
	Café Bustelo Dark Roast, Special for Espresso Coffee (ground, not brewed)	153
	Café Du Monde Decaffeinated Coffee and Chicory (ground, not brewed)	149
	Café Oquendo 100% Pure Coffee (ground, not brewed)	168
	Café Regil Rige Y Regira 100% Coffee (ground, not brewed)	203
	Caribou Coffee Rainforest Blend Whole Bean Coffee (ground, not brewed)	180
	Chock full o'Nuts The Heavenly Coffee, All-Method Grind (ground, not brewed)	197
	Community Coffee & Chicory New Orleans Blend (ground, not brewed)	459
	French Market Restaurant Blend Coffee and Chicory (ground, not brewed)	609
	Harmony Bay Breakfast Blend Coffee (ground, not brewed)	102
	Hawaiian Isles Kona Coffee Company Kona Sunrise Coffee (ground, not brewed)	97
	Luzianne Coffee & Chicory (ground, not brewed)	380
	McGarvey Twin Cities Blend Ground Coffee (ground, not brewed)	93
	New England Coffee Company French Roast (ground, not brewed)	94
	Seaport 100% Pure Coffee Dark Roast (ground, not brewed)	148
	Seattle's Best Coffee Medium Roast Coffee	91

	(ground, not brewed)	
	Simon David Gourmet Chocolate Truffle Decaf Whole Bean (ground, not brewed)	27
<b>Breads and Bakery Products</b>	A Toast to Bread Italian Corn Bread	ND
	Alois J. Binder Bakery, Inc. Rye Bread	ND
	Alois J. Binder Bakery, Inc. Seven Grain Bread	51
	Angelo Gendusa Bakery French Bread	ND
	Arnold Health Nut Bread	47
	Arnold Premium Cornbread Stuffing	57
	Atlanta Bread Company Nine Grain Bread	59
	Atlanta Bread Company Pumpernickel Bread	25
	Big Land Midnight Bread	24
	Bimbo Sliced White Bread	ND
	Byerly's Fancy Fruit Bread	ND
	Byerly's Potato Bread	41
	Byerly's Brand Thick Cut "Texas Toast" Bread	ND
	Carnival Enriched Bread Wheat	ND
	Cobblestone Mill Breakfast Bread Cinnamon Raisin Swirl	43
	EatZi's Olive Focaccia	ND
	Flowers Bakeries Bunny Bread	ND
	Flowers Bakeries Dandee Old Fashioned Enriched Bread	ND
	Food for Life 7 Sprouted Grains Bread	ND
	Freihofer's Country Potato Bread	52
	Freihofer's Country White Bread	30
	Freihofer's Real Jewish Rye Bread Seedless	22
	Freihofer's Stone Ground 100% Whole Wheat Bread	25
	Leidenheimer Baking Co. Reising's Pistolettes (Bread Rolls)	ND
	McKee Foods Honey Bun	23
	Hubig's New Orleans Style Pie, Fried Apple Pie	ND
	Hubig's New Orleans Style Pie, Fried Pineapple Pie	ND
	International Food Land Pita Bread	26

	Krispy Kreme Original Glazed Doughnuts, Sample 1	ND
	Krispy Kreme Original Glazed Doughnuts, Sample 2	22
	Kroger Artificially Flavored Apple Fruit Pie, Real Fruit Filling	ND
	Kroger White Mountain Bread	35
	Lender's Bagel Shop Bagels (Plain)	ND
	Mrs. Baird's Honey Nut N' Oat Bread	ND
	Natural Ovens Bakery Cracked Wheat Whole Grain Bread	44
	Nature's Own Honey Wheat Bread	36
	Oroweat Oatnut Original Bread	20
	Otis Spunkmeyer Banana Nut Muffins	29
	Turco's Specialty Supermarket Prosciutto Bread	30
	Publix Pumpernickel Bread	31
	Publix Seeded Rye Bread	31
	Stater Bros. Family Style White Enriched Bread	ND
	Stater Bros. Big White Enriched Bread	ND
	Stop & Shop Authentic Italian Bread	ND
	Tom Thumb Bakery Country French Deli Style Bread	25
	Valley Grains Canadian Oat Bread	29
	Valley Grains Whole Wheat Bread	45
	Wonder Premium Potato Bread	58
Cereals	Back to Nature Oat Bran Flakes	82
	Cub Foods Cocoa Comets	87
	Exceptional Value Corn Flakes Cereal	395
	Fiesta Crispy Honey Oats & Flakes	141
	General Mills Count Chocula	205
	General Mills Frosted Cheerios	61
	General Mills Honey Nut Clusters	122
	General Mills Multi-Bran Chex Cereal	171
	General Mills Trix	34
	Grainfield's Oven Toasted Corn Flakes	102
	Grainfield's Whole Grain Raisin Bran	169

	Kashi GOLEAN Crunch	122
	Kashi GOLEAN	106
	Kellogg's Apple Jacks	ND
	Kellogg's Frosted Flakes of Corn	94
	Kellogg's Raisin Bran	101
	Kellogg's Special K	123
	Malto-O-Meal Frosted Mini Spooners	163
	Natural Ovens Bakery Great Granola	25
	Post Raisin Bran	154
	Post Shredded Wheat 'N Bran	161
	Publix Apple Cinnamon Toasted Oats	107
	Publix Corn Flakes	70
	Publix Frosted Flakes	51
	Quaker Oat Cap'n Crunch	43
	Quaker Oat Cinnamon Life	42
	Sam's Choice Extra Raisin Raisin Bran Cereal	91
	Saver's Choice Corn Flakes, Sample 1	488
	Saver's Choice Corn Flakes, Sample 2	534
	Shurfine Crispy Rice Cereal	33
	Stater Bros. Freaky Fruits	92
	Stop & Shop Confruity Crisp	ND
	Suncorn Sugar Frosted Flakes of Corn	97
	Winn Dixie Corn Flakes	197
	Winn Dixie Frosted Flakes	232
	Winn Dixie Fruit Wheels	28
Cookies	America's Choice Animal Cookies	103
	Brent & Sam's All Natural Key Lime White Chocolate Gourmet Cookies	69
	Chez Pierre Bakery Gingerbread Cookies	180
	Cub Foods Peanut Butter Creme Sandwich Cookies	108
	Kroger Holiday Sugar Cookies	ND
	Kroger Private Selection Chocolate Chunk Pecan Cookies	44
	Kroger Private Selection Double Chocolate Chunk Cookies	38

	Lil' Dutch Maid Oatmeal Cookies	137
	Mrs. Fields Premium Cookies Chewy Fudge	34
	Nabisco Doublestuf Oreo Chocolate Sandwich Cookies	49
	Nabisco Lorna Doone Shortbread Cookies	61
	Nabisco Nutter Butter Creme Patties	93
	Publix Bakery Christmas Bell Cookies	ND
	Publix Peanut Butter Passion Bites	143
	Rippin' Good Ginger Snap Cookies	955
	Stater Bros. Premium Artificially Flavored Lemon Creme Wafers	114
	Stater Bros. Premium Caramel Striped Shortbread Cookies	124
	Stater Bros. Premium Chocolate Sandwich Creme Cookies	218
	Stater Bros. Premium Creme Wafers	94
	Stater Bros. Raspberry Topped Shortbread Cookies	71
	Stella D'oro Breakfast Treats Cookies	34
	The Bagel Factory Oatmeal Chocolate Chip Cookies	47
	The Bagel Factory Oatmeal Raisin Cookies	55
	Whole Foods Market 365 Chocolate Sandwich Cremes	37
	Wortz Vanilla Wafers	61
<b>Crackers</b>	America's Choice Graham Crackers	266
	America's Choice Oyster Crackers	189
	Austin Toasty Crackers with Peanut Butter	412
	Barbara's Bakery Rite Lite Rounds	341
	Blue Diamond Smokehouse Almond Nut Thins	86
	Sunshine Cheez-It Baked Snack Crackers	41
	Cub Foods Saltine Crackers	87
	Edward & Sons Brown Rice Snaps-Tamari Seaweed	248
	Edward & Sons Brown Rice Snaps-Cheddar	242
	Health Valley Low Fat Bruschetta Vegetable Crackers	784



	Health Valley Original Oat Bran Graham Crackers	1540
	Jacobsen's Snack Toast	55
	Star Bakery Kika Cuban Crackers	39
	Krispa Oyster Crackers	147
	Kroger Baked Big Cheese Bits	63
	Log House Original Snack Toast	60
	Nabisco Grahams	944
	Nabisco Unsalted Tops Premium Saltine Crackers	65
	Old London Melba Snacks Bacon Flavor	83
	Old London Melba Snacks White	174
	Eli's Olive Rosemary Crisps	553
	Pepperidge Farm Cheddar Goldfish Baked Snack Cracker	75
	Pepperidge Farm Entertaining Butter Flavored Thins Crackers	196
	Ry Krisp, Sesame	515
	Siljans Whole Rye Crispbread Rounds	96
	Snyder's of Hanover Honey Wheat Sticks	101
	Sunshine Krispy Soup & Oyster Crackers	141
	Turco's Specialty Supermarket Pepper Toast	226
	Wild Oats Wheat Weavers	86
<b>Fruit and Vegetable Products</b>	French's Original French Fried Onions	125
	Fry's Food & Drug Stores Prune Juice	138
	Giorgio Homestyle Breaded Mushrooms (Frozen)	103
	Kroger Dried Plums (Pitted Prunes)	87
	Langers Prune Juice Plus	188
	Mariani Premium Pitted Dried Plums, Sweet Pitted Prunes	31
	Sun Maid Natural California Raisins	ND**
	Sunsweet Prune Juice	239
	The Produce Stand California Seedless Raisins	ND**
<b>Miscellaneous Packaged Foods</b>	Gabila's Potato Knishes	ND
	La Fe Ground Toasted Corn	804
	T.G.I. Friday's Cheddar & Bacon Potato Skins (Frozen)	393
	T.G.I. Friday's Chicken Quesadilla Rolls (Frozen)	ND

	Totino's Cheese Pizza Rolls (Frozen)	29
Olives	Aiello Kalamata Black Olives	ND
	Asti Imported Gaeta Olives	ND
	Bella Mia Bella di Cerignola Olives in Brine	ND
	Cento Imported Gaeta Olives	46
	Cento Spanish Salad Olives	ND
	Cinquina Sole d'Abruzzo La Tenera d'Abruzzo Olives	ND
	Coluccio Calabrese Olives in Brine	ND
	Helena Kalamata Olives, Natural Greek Olives in Brine	ND
	Martinis Pitted Selected Natural Kalamata Olives	ND
	Mideast Cracked and Spicy Green Olives	ND
	Mt. Carmel Gourmet Foods Marinated Nolellata Olives	ND
	Mt. Carmel Gourmet Foods Sicilian Olives Stuffed with Sundried Tomatoes	ND
	Paradise Spanish Salad Olives	ND
	Pastene Imported Greek Black Olives	ND
	Pastene Imported Pitted Ripe Olives, Extra Large	798
	Sclafani Spanish Manzanilla Olives Stuffed with Minced Pimento	ND
	Krinos Kalamata Olives in Vinegar Brine and Olive Oil	ND**
	Cento Medium Pitted California Green Olives	19**
	Bulk Green Olives	ND**
Potato Chips	Dirty All Natural Potato Chips, Jalapeno Heat	462
	Herr's Pennsylvania Dutch Style Kettle Crunch Potato Chips	880
	Herr's Crisp 'N Tasty Potato Chips	662
	National Food Mariquitas Sweet Potato Chips	1570
	Old Dutch Onion 'N Garlic Flavored Potato Chips	664
	Dutch Crunch Original Kettle Chips	505
	Poore Brothers Potato Chips	617
	Publix Dip Style Potato Chips	847
	Schlotzsky's Deli Deli-Style Barbeque Potato Chips	791

	Stater Bros. Potato Chips	497
	T. G. I. Friday's Potato Skins Snack Chips, Sour Cream & Onion	639
	Tom's Hot Flavored Potato Chips	629
	Trader Joe's Veggie Chips Potato Snacks	1970
	Zapp's Regular Potato Chips	517
	Zapp's Spicy Cajun Crawtators Potato Chips	868
	Zapp's Regular Sweet Potato Chips	647
<b>Snack Foods (Other than Potato Chips)</b>	Amazon Food Products Chili Jalapeno Plantain Chips	180
	Bachman Nutzels Bite Size Pretzels	246
	Elmer's Baked Bar-B-Que Chee Wees	108
	Fiesta Mart Bulk Cracklings (Fried Pork Rinds)	ND
	INKA Roasted Plantain Chips	71
	Iselitas Thin and Crispy Plantain Chips, Reduced Fat	522
	Kroger Potato Sticks	979
	Lance Don Pablo's Restaurant Style Tortilla Chips	185
	Medallion Nacho Cheese Tortilla Chips	196
	National Food Mariquitas Plantain Chips, 100% Natural	296
	National Food Rico's Corn Chips	282
	National Food Rico's Crackling Pork Rinds (Chicharrones Criollos)	ND
	Old Dutch Pretzel Sticks	46
	Old Dutch Puffcorn Curls	65
	Old Dutch Restaurante Style Bite Size Premium Tortilla Chips	130
	Potato Mania Potato Stix	924
	Premium Poppers Butter Flavored Gourmet Popcorn	446
	Publix Pretzels Honey Mustard	57
	Royal Sire Sourdough Mini Pretzels	48
	Sack'n Save Tortilla Chips	179
	Snyder's of Hanover Cheddar Cheese Pieces	166
	Snyder's of Hanover Rods Pretzels	386
	Snyder's of Hanover Unsalted Mini Pretzels	58

		Snyder's of Hanover Veggie Crisps	1340
		Stater Bros. Cheese Puffs	166
		Stater Bros. Pretzels	180
		Terra Exotic Vegetable Chips	828
		Trader Joe's Roasted & Salted Soy Nuts	91
		Trader Joe's Vegetable Chip Mix with Salt	73
		Tropical Del Campo Iselitas Cassava Chips (Yuca), Thin and Crispy	62
		Winn Dixie Party Minis Pretzels	101
		Yu-qui-tas Cassava Chips	30
<b>Taco, Tostada, and Tortilla Products</b>		Casa Fiesta Taco Shells	50
		Dallas Tortillas Original Tostadas	794
		El Milagro Flour Tortillas	33
		Ibarra's La Preferida Super Tostadas	337
		La Reina Taco Shells	69
		Mission Taco Shells	44
		Mission Taco Shells Jumbo	29
		Mission Taco Shells White Corn	66
<b>Restaurant and Take-Out Foods</b>	<b>Asian Restaurant and Take-Out Foods</b>	Asian Gourmet Sesame Chicken	ND
		Asian Gourmet Sweet and Sour Chicken	ND
		Bamboo Club Hawaiian Macadamia Nut Chicken	ND
		Bamboo Club Mandarin Orange Beef	ND
		Bamboo Club Mandarin Orange Chicken	ND
		Bamboo Club Sesame Honey Chicken	ND
		Bamboo Club Sizzling Saigon Beef	ND
		Bamboo Club Sizzling Saigon Chicken	ND
		Bamboo Club Vietnamese Black Pepper Shrimp and Chicken	ND
		China House Restaurant Deep Fried Breaded Shrimp	ND
		Chinese Kitchen Fried Egg Rolls	28
		Chinese Kitchen Fried Wontons	76
		Chinese Kitchen Shrimp Fried Rice	30
		Crystal Cup Crispy Spring Rolls	ND
		Dragon Palace Restaurant Seafood Delight	ND
		Dragon Palace Restaurant Stir Fried Green Beans	ND

	East Manor Restaurant & Caterers Baked Barbeque Pork Buns	ND
	East Manor Restaurant & Caterers Fried Breaded Shrimp Wrapped in Bacon	ND
	East Manor Restaurant & Caterers Fried Taro Pancakes with Shrimp Filling	64
	Foodies Kitchen: A Meals Market Sesame Green Beans	ND
	Genghis Grill Stir Fried Baby Corn	ND
	Genghis Grill Stir Fried Cabbage	ND
	Genghis Grill Stir Fried Mushrooms	ND
	Genghis Grill Stir Fried Snow Peas	ND
	Happy City Deep Fried Snack Noodles	113
	Happy City Vegetable Egg Rolls	ND
	Happy Garden II Restaurant Fried Breaded Shrimp	ND
	Happy Garden II Restaurant Mandarin Chicken	ND
	Jumbo China Buffet Stir Fried Green Beans	ND
	Jumbo China Buffet Stir Fried Rice Noodles	ND
	Jumbo China Restaurant Deep Fried Pork/Vegetable Egg Roll	ND
	Jumbo China Restaurant Dried Snack Noodles	26
	Laifood Fried Breaded Pork Chop	ND
	Laifood Taiwanese Fried Chicken	ND
	Little Toyko Express Rice Breaded Imitation Crab	ND
	Lotus Restaurant Cream Cheese Wontons (Frozen)	ND
	Manchu Wok Beef and Broccoli	26
	Manchu Wok Fried Rice	ND
	Mayflower Chinese Restaurant Breaded Fried Chicken Fingers	ND
	New China Restaurant Honey Pork	84
	Out To Lunch Cooked Lo Mein Noodles	ND
	Out To Lunch Vegetable Delight	ND
	Pei Wei Asian Diner Fried Rice	31
	Pei Wei Asian Diner Spring Roll	ND
	Pei Wei Asian Diner Steamed Broccoli	ND
	Ping House Chinese Restaurant Fried Chicken Wings	ND

		Ping House Chinese Restaurant Fried Egg Roll	ND
		Ping House Chinese Restaurant Deep Fried Rice Snack Noodles	169
		Ping House Chinese Restaurant Fried Wonton	ND
		Ping House Chinese Restaurant Pork Fried Rice	26
		Ping House Chinese Restaurant Sliced Roast Pork	ND
		Ping House Chinese Restaurant Szechuan Chicken	ND
		Yang Tze River Restaurant Radish Sou-Bing	ND
	<b>Southern/Cajun Restaurant and Take-Out Foods</b>	Bojangles' Cajun Fried Chicken Breasts	ND
		Bojangles' Cajun Pinto Beans	40
		Bojangles' Macaroni and Cheese	ND
		Poche's Market and Restaurant Green Peas	ND
		Poche's Market and Restaurant Potato Salad	ND
		Good Eats Chicken Fried Chicken	27
		Good Eats Fried Okra	50
		Good Eats Texas Twisters Fried Onion Rings	56
		Gullah Cuisine Lowcountry Restaurant Fried Okra	59
		Hub City Diner Chicken and Sausage Gumbo	29
		Joel Restaurant Fried Eggplant	94
		Kroger's Fried Chicken	ND
		Mary Mac's Tea Room Black-Eyed Peas	ND
		Mary Mac's Tea Room Sweet Potato Souffle	89
		Maurice's Bar-B-Q Restaurant BBQ Pork	ND
		Piccadilly Cafeteria Breaded Fried Catfish	93
		Piccadilly Cafeteria Collard Greens	ND
		Piccadilly Cafeteria Corn Sticks	ND
		Sam's Country Kitchen Baked Cobbler	ND
		Sam's Country Kitchen BBQ Beef	ND
		Sam's Country Kitchen Biscuits	ND
		Sam's Country Kitchen Cornbread	ND
		Sam's Country Kitchen Fried Okra	142
		Sam's Country Kitchen Onion Rings	202
		Smokey John's Bar-B-Q Black-Eyed Peas	ND
		Smokey John's Bar-B-Q Smoked Sausage	ND
		Smokey John's Bar-B-Q Baked Sweet Potatoes	ND

		T-Coon's Restaurant & Catering Fried Chicken Breast with Wing	ND
		The Pit Bar-B-Q Fried Biscuits	ND
		The Pit Bar-B-Q Frog Legs	34
		Ton's Drive Inn Red Beans	ND
		Wal-Mart Supercenter Fried Catfish Filets	ND
		Winn Dixie Candied Yams	33
		Winn Dixie Collard Greens	ND
		Woodfire Grill Fried Cauliflower	92
	<b>Hispanic Restaurant and Take-Out Foods</b>	188 Bakery Cuchifrito's Alcapurria (Deep Fried Grated Green Bananas and Green Plantains)	ND
		188 Bakery Cuchifrito's Rellenos De Pappas (Deep Fried Mashed Potatoes with Meat Filling)	ND
		Adobe Cantina & Salsa Chile Rellenos with Cheese	ND
		Baja Fresh Chicken Enchiladas	65
		Baracoa Cuban Cafe Fried Plantains	ND
		Byerly's Mexican Food Dinner (Chicken Burritos, Red Beans and Rice)	ND
		Carnival Food Stores Fried Meat and Bean Burrito	38
		Casa Lupita Mole Chicken with Beans and Rice	154
		Casa Lupita Vegetable Burrito with Chips	ND
		Casa Tequila Beef Chimichanga	ND
		Chipotle Mexican Grill Barbacoa Tacos	57
		Chipotle Mexican Grill Carnitas Tacos	ND
		Chipotle Mexican Grill Vegetarian Burrito	ND
		Cub Foods Beef Tacos	ND
		Cub Foods Chicken Chimichanga	ND
		Cucos Mexican Cafe Beef and Cheese Enchiladas with Refried Beans	ND
		El Lina Restaurant Croquetas	97
		El Lina Restaurant Patelitos	ND
		El Pollo Grande Restaurant Fried Plantains	ND
		El Potro Mexican Restaurant Taco Salad	26
		El Tropico Restaurant & Cafeteria Cuban Sandwich	ND
		El Tropico Restaurant & Cafeteria Media Noche	ND

	Sandwich	
	El Tropico Restaurant & Cafeteria Tostones (Fried Green Plantains)	111
	El Tropico Restaurant & Cafeteria Yuca Con Mojo	ND
	Fiesta Latina Restaurant Fried Plantains	25
	Fiesta Mart Fried Plantains	ND
	Gloria's Restaurant Bean and Cheese Nachos	129
	Gloria's Restaurant Grilled Quail	32
	Gloria's Restaurant Shrimp Nachos	58
	Huichos Bakery Fried Plantains	ND
	Jalapenos Mexican Restaurant Nachos and Cheese	90
	Juarez Mexican Restaurant Cheese Quesadillas	26
	Justin's Restaurant & Bar Fried Plantains	ND
	Karamba Cafe Fried Plantains	59
	Karamba Cafe Fried Sweet Plantains	ND
	Karamba Cafe Tostones (Fried Green Plantains)	43
	La Adelita Food Company Fried Plantains	ND
	Macayo's Mexican Kitchen Beef Chimichanga	ND
	Macayo's Mexican Kitchen Beef Quesadilla	ND
	Macayo's Mexican Kitchen Fried Corn Tortilla Chips	37
	Madrid Restaurante Castilian Lamb Stew	ND
	Norma's Sweets Bakery Conchas	ND
	Rolberto's Taco Shop Taco and Cheese Enchilada Dinner	ND
	Rosita's Fine Mexican Food Restaurant Beef Chili	201
	Rosita's Fine Mexican Food Restaurant Beef Tamale	65
	Rosita's Fine Mexican Food Restaurant Chili Relleno	25
	R-Ranch Market Fried Plantains	ND
	Taco Bell Bean Burrito	ND
	Taco Bell Mexican Pizza	53
	Taco Tico Restaurant Steak Burrito	ND
	The Latin American Grill Chicharrones (Fried Pork Skins)	ND



		The Latin American Grill Empanada De Carne (Fried Meat Pie)	35
		The Latin American Grill Papa Relleno (Meat Stuffed Potato Balls)	67
		Willy's Mexicana Grill Black Beans	ND
		Willy's Mexicana Grill Chicken Soft Taco	ND
		Winn Dixie Fried Plantains	ND
	<b>French Fries and Other Potato Foods, Restaurant and Take-Out</b>	Burger King Hash Browns	768
		Byerly's Potato Pancakes	229
		Chick-fil-A Waffle Potato Fries	271
		Denny's French Fries	305
		Happy City French Fries	109
		Ingebretsen's Lefse	927
		Karamba Cafe French Fries, Sample 1	353
		Karamba Cafe French Fries, Sample 2	122
		Long John Silver's French Fries	337
		McDonald's French Fries	428
		New Orleans Hamburger & Seafood Co. Homestyle Fries	236
		Sam's Country Kitchen French Fries	1130
		The Great Steak & Potato Company Fresh Cut Fries	836
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	<b>Other Fruits and Vegetables, Restaurant and Take-Out</b>	Blue Mesa Grill Grilled Asparagus	ND
		Blue Mesa Grill Sweet Potato Chips	4080
		Byerly's Potato Wedges	ND
		Central Market Grilled Carrots	61
		Central Market Grilled Onions	70
		Central Market Roasted Dill Carrots	ND
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		Piccadilly Cafeteria Roasted Red Bliss Potatoes	143
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		T.G.I. Friday's Roasted Garlic Vegetable Medley	ND
		Turco's Specialty Supermarket Roasted Mixed Vegetables	ND
		Turco's Specialty Supermarket Roasted Red Potatoes	190
		Wal-Mart Supercenter Cinnamon Apples	ND
		Winn Dixie Green Beans	ND
	<b>Other Miscellaneous Restaurant Foods</b>	A & W All American Food Fried Cheese Curds	20
		La Petite Patisserie Chicken Patties	ND
		Pappadeaux Seafood Kitchen Fried Calamari	73
		Sam's Country Kitchen Grilled Hamburger	ND
<b>Infant Formula</b>	<b>Infant Formula Analyses, LOQ = 20 ppb</b>	Mead Johnson Enfamil A.R. Lipil, Ready to Feed (Lot #1)	ND
		Mead Johnson Enfamil A.R. Lipil, Ready to Feed (Lot #2)	ND
		Mead Johnson Enfamil Low Iron, Powder (Lot #1)	ND
		Mead Johnson Enfamil NEXT STEP LIPIL, Powder (Lot #1)	ND
		Mead Johnson Enfamil NEXT STEP LIPIL, Powder (Lot #2)	ND
		Mead Johnson Enfamil NEXT STEP ProSobee LIPIL, Powder (Lot #1)	ND
		Nestle Good Start 2 Essentials, Concentrate	ND
		Nestle Good Start 2 Essentials, Ready to Feed (Lot #1)	ND
		Nestle Good Start 2 Essentials, Ready to Feed (Lot #2)	ND
		Nestle Good Start Supreme DHA & ARA, Concentrate (Lot #1)	ND
		Nestle Good Start Supreme DHA & ARA, Concentrate (Lot #2)	ND
		Nestle Good Start Supreme DHA & ARA, Ready to Feed (Lot #1)	ND
		Nestle Good Start Supreme DHA & ARA, Ready to Feed (Lot #2)	ND
		Nestle Good Start Supreme, Ready to Feed (Lot	ND

		#1)	
		Nestle Good Start Supreme, Ready to Feed (Lot #2)	ND
		Ross Similac Alimentum Advance, Ready to Feed (Lot #1)	ND
		Ross Similac Alimentum Advance, Ready to Feed (Lot #2)	ND
		Ross Similac Isomil Advance, Ready to Feed (Lot #1)	ND
		Ross Similac Lactose Free, Ready to Feed (Lot #1)	ND
		Ross Similac Low Iron, Ready to Feed (Lot #1)	ND
		Ross Similac Low Iron, Ready to Feed (Lot #2)	ND
		Wyeth Healthy Baby Infant Formula Soy Based, Ready to Feed (Lot #1)	ND
		Wyeth Safeway SELECT Infant Formula, Milk Formula with Iron, Powder (Lot #1)	ND
		Wyeth Safeway SELECT Infant Formula, Milk Formula with Iron, Powder (Lot #2)	ND
		Wyeth Safeway SELECT Infant Formula, Soy Formula with Iron, Powder (Lot #1)	ND
	<b>Infant Formula Analyses, LOQ = 10 ppb</b>	Mead Johnson Nutritionals 3232 A, Powder	ND
		Mead Johnson Nutritionals 80056, Powder	ND
		Mead Johnson Enfamil LIPIL Low Iron, Powder (Lot #1)	ND
		Mead Johnson Enfamil LIPIL Low Iron, Powder (Lot #2)	ND
		Mead Johnson Enfamil Low Iron, Powder (Lot #2)	ND
		Mead Johnson Enfamil NEXT STEP ProSobee LIPIL, Powder (Lot #2)	ND
		Mead Johnson Enfamil Nutramigen LIPIL, Powder (Lot #1)	ND
		Mead Johnson Enfamil Nutramigen LIPIL, Powder (Lot #2)	ND
		Mead Johnson Enfamil ProSobee LIPIL, Powder (Lot #1)	ND
		Mead Johnson Enfamil ProSobee LIPIL, Powder (Lot #2)	ND
		Nestle Good Start 2 Essentials With Iron, Powder	ND
		Nestle Good Start 2 Essentials With Iron, Ready to	ND

	Feed	
	Nestle Good Start Essentials Soy, Concentrate (Lot #1)	ND
	Nestle Good Start Essentials Soy, Concentrate (Lot #2)	ND
	Nestle Good Start Supreme DHA & ARA, Ready to Feed	ND
	Ross Pediatrics EleCare, Powder	ND
	Ross Metabolics Cyclinex-1, Powder	ND
	Ross Metabolics Hominex-1, Powder	ND
	Ross Metabolics Ketonex-1, Powder	ND
	Ross Metabolics Phenex-1, Powder	ND
	Ross Similac Human Milk Fortifier, Powder	ND
	Ross Similac Isomil Advance, Ready to Feed (Lot #2)	ND
	Ross Similac Lactose Free Advance, Powder	ND
	Ross Similac Lactose Free, Powder	ND
	Ross Similac Lactose Free, Ready to Feed (Lot #2)	ND
	Wyeth Parent's Choice Infant Formula with Lipids DHA & ARA, Powder (Lot #1)	ND
	Wyeth Parent's Choice Infant Formula with Lipids DHA & ARA, Powder (Lot #2)	ND
	Wyeth Healthy Baby Infant Formula Soy Based, Ready to Feed (Lot #2)	ND
	Wyeth Safeway SELECT Infant Formula, Soy Formula with Iron, Powder (Lot #2)	ND

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For more recent information on Acrylamide in Food, see  
<http://www.cfsan.fda.gov/~lrd/pestadd.html#acrylamide>.

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The world of microbes

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# Microbiology and Bacteriology

## The world of microbes

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### 12-1 An introduction to lactic acid bacteria

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Lactic acid bacteria are gram-positive usually non-motile, non-spore-forming rods and cocci. They lack the ability to synthesize cytochromes and porphyrins (components of respiratory chains) and therefore cannot generate ATP by creation of a proton gradient. The lactics can only obtain ATP by fermentation, usually of sugars. Since they do not use oxygen in their energy production, lactic acid bacteria happily grow under anaerobic conditions, but they can also grow in oxygen's presence. They are protected from oxygen byproducts (e.g.  $H_2O_2$ ) because they have peroxidases. These organisms, as defined in experiment 3, are aerotolerant anaerobes. They are differentiated from other organisms by their ability to ferment hexoses to lactic acid, hence the name. Lactic acid bacteria can be divided into two groups based upon the products produced from the fermentation of glucose. Homofermentative organisms ferment glucose to two moles of lactic acid, generating a net of 2 ATP per mole of glucose metabolized. Lactic acid is the major product of this fermentation. Heterofermentative lactic acid bacteria ferment 1 mole of glucose to 1 mole of lactic acid, 1 mole of ethanol, and 1 mole of  $CO_2$ . One mole of ATP is generated per mole of glucose, resulting in less growth per mole of glucose metabolized. Because of the low energy yields, lactic acid bacteria often grow more slowly than microbes capable of respiration, and produce smaller colonies of 2-3 mm.

It is easy to determine whether a lactic acid bacteria has a homo- or heterofermentative metabolism by the hot-loop test. A major end-product of heterofermentation is  $CO_2$ . In a medium containing glucose this gas is highly soluble at high pH and will stay in solution. If, however, the temperature of the solution is increased,  $CO_2$  will become insoluble and will be released in the gaseous form. The hot-loop test consists of growing a test isolate to saturation in a medium containing glucose. After incubation, a wire loop (inoculating loop) is heated to redness and plunged into the broth culture. This causes the liquid around the loop to heat up. If a test organism is heterofermentative,  $CO_2$  bubbles will evolve close to the loop.

The lactic acid bacteria have limited biosynthetic ability, requiring preformed amino acids, B vitamins, purines, pyrimidines and typically a sugar as carbon and energy source. A rich medium is usually employed when cultivating lactics. These multiple requirements restrict their habitats to areas where the required compounds are abundant (animals, plants, and other multicellular organisms). Lactic acid bacteria can grow at temperatures from 5-45°C and not surprisingly are tolerant to acidic conditions, with most strains able to grow at pH 4.4.

### The genera of lactic acid bacteria

Lactics are classified by the fermentation pathway used to ferment glucose and by their cell morphology. *Lactobacillus* are rod shaped organisms that can be either hetero- or homofermentative. They are widespread and can be isolated from many plant and animal sources. Lactobacilli are more tolerant to acid than the other genera of lactic acid bacteria and this property makes them important in the final phases of many food fermentations when other organisms are inhibited by the low pH.

*Leuconostoc* are ovoid cocci, often in chains. All bacteria of this genus have a heterofermentative mode of metabolism. When grown in media containing sucrose, copious amounts of a slimy polysaccharide (dextran) are produced. Dextran has found uses in medicine as a plasma extender and in biotechnology.

*Pediococcus* are cocci often found in pairs and tetrads that are strictly homofermentative. Their habitat is restricted mainly to plants. *P. cerevisiae* has been used as a starter culture for the fermentation of some sausages with great success. *Streptococcus* are cocci in chains that are distinguished from the *Leuconostoc* by their strictly homofermentative metabolism. These

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organisms can be isolated from oral cavities of animals, the intestinal tract, skin, and any foods that come in contact with these environments. While the other genera of lactic acid bacteria rarely cause disease, *Streptococcus pyogenes* is a common, troublesome pathogen, causing strep throat and rheumatic fever.

*Enterococcus* and *Lactococcus* are two recent taxonomic divisions of lactic acid bacteria. These were created to reorganize the large and divergent *Streptococcus* genus into smaller, more related groups of bacteria. Enterococcus are gram-positive cocci that form pairs or chains. They are distributed widely in the environment, particularly in feces of vertebrates. Strains can grow in the presence of 6.5% NaCl and with 40% bile present.

*Lactococcus* includes strains that are gram-positive, spherical cells occurring in pairs or chains. They have a strictly homofermentative metabolism and are found in dairy and plant products. For centuries lactic acid bacteria have been used to produce fermented food products including pickles, sauerkraut, sausage, yogurt, cheese, buttermilk, soy sauce, and more. Some examples include *Streptococcus thermophilus* along with *Lactobacillus bulgaricus* that are used in the production of yogurt. Also, *Lactococcus lactis* and *S. thermophilus* are two strains often used as starter cultures in the production of cheese. Finally, *Lactobacillus* and *Leuconostoc* are useful in the fermentation of cabbage to sauerkraut.

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